REMARKS

Reconsideration of this application, based on this amendment and these following remarks, is respectfully requested.

Upon entry of this amendment, claims 3, 4, 6 through 11, 13, 16 through 21, 23, 26 through 28, and 30 through 34 will remain in this case. Amendment to claims 3, 4, 7 through 9, 11, and 21, is proposed. Claims 1, 5, 14, 15, 25, 38, 40 through 42, 44, and 45 are proposed to be canceled.

Claims 1, 4 through 7, 9, 11, 14 through 17, 19, 21, 24 through 26, 28, 31 through 33, 38, and 42 were finally rejected under §103 as unpatentable over the Bassett et al. reference[1] in view of the Yada et al. reference[2]. Claims 3, 13, 23, 30, 36, 40, and 44 were rejected under §103 as unpatentable over the Bassett et al. reference and Yada et al. references, further in view of Applicants' admitted prior art. Claims 9, 10, 19, 20, 27, 34, 37, 41, and 45 were rejected under §103 as unpatentable over the Bassett et al. reference and Yada et al. references, further in view of the Kramer reference[3], and claims 4, 5, 7, 8, 14, 15, 17, 18, 24, 25, 31, and 32 were rejected under §103 as unpatentable Bassett et al. reference and Yada et al. references, further in view of the Bruce et al. reference[4].

Claim 1 is canceled to further the prosecution of this case. Claim 4 is proposed to be amended to be placed in independent form, incorporating the limitations of previously presented claim 1, upon which it depended. Claim 3 is proposed to be amended to depend on claim 4, and claim 5 is proposed to be canceled, given the amendment to claim 4 and the cancellation of claim 1. Accordingly, there is no difference in the scope of claim 4 as a result of the proposed amendment to that claim.

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[1] U.S. Patent No. 6,747,827 B1, issued June 8, 2004 to Bassett et al.
[2] U.S. Patent Application Publication US 2002/0032891 A1, published March 14, 2002, from an application filed August 27, 2001.
[3] U.S. Patent No. 6,182,239 B1, issued January 20, 2001 to Kramer.
[4] U.S. Patent No. 5,956,743, issued September 21, 1999 to Bruce et al.

Claims 7 through 9 and 11, previously dependent on claim 1, are proposed to be amended to now depend on independent claim 6, to advance the prosecution of this case. Claims 14 and 15 are canceled accordingly.

Applicants respectfully traverse the final rejection of claim 4, and submit that proposed amended claim 4 and its dependent claims are patentably distinct over the Bassett et al. and Yada et al. references.

Claim 4 recites, as it did previously, that each of the plurality of blocks in the non-volatile memory to which the claimed method refers includes an indicator that is indicative of whether that block is a reclaimed block. Responsive to this indicator meeting a criterion for a first identified block, data to be written to the first block is encoded according to a first error detection algorithm, and then written to that first block. For a second block, responsive to its indicator not meeting the criterion,[5] the data to be written to this second block is encoded according to a second error detection algorithm that has a higher error detection capability, following which the data is written to that second block. As a result of the method of claim 4, as discussed in previous amendments, the non-volatile memory can eventually include some blocks storing data encoded according to one error detection algorithm, and other blocks storing data that is encoded according to a different error detection algorithm. This maximizes the efficiency with which data is stored in the non-volatile memory, by using ECC of lesser strength (and lesser overhead) for blocks with good expected reliability, and ECC of higher strength where necessary to reclaim blocks.

Applicants submit that the rejection of claim 4 is in error, because the combined teachings of the references fall short of the requirements of the claim. Specifically, neither of the references teaches the use of an indicator of reclaimed blocks as an indicator according to which the error detection encoding algorithm is selected.

[5] *E.g.*, the criterion being that the block is not a reclaimed block, so that an indicator indicating that the block is reclaimed does not meet this criterion.. Specification of S.N. 10/678,893, page 20, lines 18 through 23.

As indicated by the Examiner, the Bassett et al. reference is directed to the error correction coding of data in a disk drive, in which different error correction strategies are applied according to the radial position of the sector to which data is to be written,[6] or according to the type of data to be written to the disk.[7] To the extent the teachings of the Bassett et al. reference in connection with encoding data for a disk drive are analogous to the method of storing data in a semiconductor non-volatile memory of claim 4,[8] there is no teaching in the Bassett et al. reference regarding the selection of an error detection algorithm based on whether a physical block has been reclaimed, as recited in claim 4.

The Yada et al. reference, while actually directed to semiconductor non-volatile memory, also lacks teachings in this regard. also does not encode data using an ECC code based on whether a block is a reclaimed block. Indeed, the Yada et al. reference does not teach making this determination based on any attribute of the block to which the data is to be written. Rather, the Yada et al. reference selects an ECC code according to the type of data to be written, with "frequently-written parameter data" stored in a specified area and using an ECC code, and "program data or the like" stored in other storage areas, without ECC coding.[9] The Examiner asserted that the Yada et al. reference statement regarding the "predetermined number of rewrite assurances" of the memory cells meets the claim in this regard.[10] However, as urged above, this number of rewrite assurances is not used to determine whether to apply ECC to the data to be written to the memory. The Examiner effectively admits this point in specifically applying the Yada et al. reference to claim 4 ("Frequently-rewritten parameter data is stored in the specified partial storage area, and program data or the like low in rewriting frequency are stored in other storage areas.").[11] According to the Yada et al. reference, therefore, it is the type of data to be written that determines in which portion of memory the data will be written, and thus whether

[6] Bassett et al., *supra,* column 5, lines 9 through 14.
[7] Bassett et al., *supra,* column 6, lines 39 through 47.
[8] Which Applicants do not admit.
[9] Yada et al., *supra,* paragraph [0029].
[10] Office Action of September 19, 2006, page 9.
[11] Office Action, *supra,* page 9.

ECC is applied.[12] Applicants therefore submit that the Yada et al. reference fails to meet the identifying and encoding steps of claim 4.

The Examiner also applies the Bruce et al. reference against claim 4, particularly with its teachings regarding erase/write counters in a wear-leveling scheme for a flash memory. However, the Bruce et al. memory fails to disclose using these counters to determine which of a plurality of ECC algorithms is to be applied to data to be encoded, and therefore necessarily fails to disclose making this determination according to an indication of whether a block is a reclaimed block.

Accordingly, Applicants submit that the combined teachings of the Bassett et al., Yada et al., and Bruce et al. references fall short of the requirements of claim 4 and its dependent claims. Applicants also submit that there is no suggestion from the prior art to modify these teachings in such a manner as to reach the claim, considering that there is no mention in any of these references of reclaiming previously failed blocks of a semiconductor flash memory, much less using an indication of whether such a block is reclaimed to determine which of multiple error detection algorithms is to be applied to data written to that block. Considering the important advantages provided by claim 4 in optimizing the storage of data in a non-volatile memory in this manner, Applicants submit that claim 4 and its dependent claims are patentably distinct over the prior art of record.

Reconsideration of the rejection of proposed amended claim 4 is respectfully requested.

Applicants also respectfully traverse the rejection of claim 6 and its dependent claims, on the grounds that the combined teachings of the applied references (Bassett et al. and Yada et al.) fall short of the requirements of the claim, and that there is no suggestion from the prior art to modify those teachings so as to reach claim 6.

As discussed above, the Bassett et al. reference is directed to the operation of a disk drive, in which different error correction strategies are applied according to the radial position of

[12] Yada et al., *supra,* paragraph [0029] (emphasis in original).

the sector to which data is to be written,[13] or according to the type of data to be written to the disk.[14] There is no mention whatsoever in the Bassett et al. reference of encoding data according to one of a first or a second error detection algorithm responsive to the value of an indicator of the number of times a block has been erased.

The Examiner asserts that the Yada et al. reference provides these teachings in connection with a semiconductor non-volatile memory, asserting that the teachings of the reference that "[f]requently-rewritten parameter data is stored in the specified partial storage area, and program data or the like low in rewriting frequency are stored in other storage areas" correspond to the claim limitation of an indicator indicative of a number of times a block has been erased.[15] Applicants disagree. The Yada et al. reference discloses a decision based on attributes of the data to be written, rather than of the block in memory to which that data will be written. In contrast, the error detection algorithm decision of claim 6 depends on the number of time the block has been erased, which is an attribute of the block to which the data is to be written, and has nothing to do with the nature of the data itself. Accordingly, Applicants submit that the Yada et al. reference also fails to disclose the encoding steps of claim 6.

Applicants therefore respectfully submit that the combined teachings of the references fall short of the requirements of claim 6. Applicants further submit that there is no suggestion to modify these teachings in such a manner as to reach claim 6.

First, the Bassett et al. reference has little if anything to do with the method of claim 6, considering that its teachings are directed to disk drives, with the error correction code decisions made based either on factors related to disk drives and not to semiconductor non-volatile memories (e.g., radial position of sectors), or on attributes of the data itself. Second, the Yada et al. reference also makes its decision regarding whether to apply error correction coding based on the nature of the data itself, and not on any attribute of the block to which the data is to be written. According to the Yada et al. reference, therefore, optimization of the memory usage

[13] Bassett et al., *supra*, column 5, lines 9 through 14.
[14] Bassett et al., *supra*, column 6, lines 39 through 47.
[15] Office Action, *supra*, page 9.

depends on the application of its non-volatile memory, and upon the nature of the data to be written. In contrast, the method of claim 6 optimizes the usage of the non-volatile memory regardless of the type of data or application, and indeed enables adjusting this optimization over time as the number of erase cycles increase for the blocks of the memory.

For these reasons, Applicants submit that claim 6 and its dependent claims are patentably distinct over the references. Reconsideration of the rejection of these claims, and withdrawal of the final rejection after such reconsideration, is respectfully requested.

Applicants also traverse the final rejection of claim 16 and its dependent claims.

As previously argued, independent claim 16 is directed to a method for reading data stored in a non-volatile memory, where the memory comprises a plurality of blocks in an array formed on a semiconductor substrate.[16] The claim also recites the step of identifying one of the plurality of blocks from which data is to be read, and obtaining an indicator from that block, where the indicator is indicative of a number of times the identified block has been erased. Responsive to determining that the indicator is less than a threshold value, the data from that block are decoded using a first error detection algorithm; on the other hand, if the indicator is not less than the threshold value, the data are decoded using a second error detection algorithm that has a higher error detection capability.

As discussed above, the Bassett et al. reference is directed to the operation of a disk drive, in which different error correction strategies are applied according to the radial position of the sector to which data is to be written,[17] or according to the type of data to be written to the disk.[18] There is no disclosure, in the Bassett et al. reference, of the reading back of data from the disk sectors, involving decoding of the data according to a selected error correction code in response to the value of an indicator, much less such an indicator having a value indicative of a number of times that a block has been erased. Indeed, there is no mention whatsoever in the Bassett et al. reference of encoding data according to one of a first or a second error detection

[16] *See, e.g.,* specification, *supra,* at page 11, lines 25 through 28; page 12, lines 4 through 5 and lines 24 through 27.
[17] Bassett et al., *supra,* column 5, lines 9 through 14.

algorithm responsive to the value of an indicator of the number of times a block has been erased. Nor does the Yada et al. reference provide such teachings in this regard. The reference teaches simply reading back data from the storage area storing ECC encoded data, by executing the error-correcting program.[19] However, neither the encoding of data nor the decoding of data is performed responsive to the value of an indicator that is indicative of a number of times a block has been erased, as claimed. At most, the reference teaches determining whether to decode using ECC based on the location of the memory from which the data is being read. This is consistent with its teachings that the encoding decision is based on attributes of the data to be written, rather than of the block in memory to which that data will be written.

Applicants therefore respectfully submit that the combined teachings of the references fall short of the requirements of claim 16. Applicants further submit that there is no suggestion to modify these teachings in such a manner as to reach claim 16 and its dependent claims.

As mentioned above, the Bassett et al. reference is directed to disk drives, and its error correction code decisions are made based either on factors that are not applicable to semiconductor non-volatile memories (*e.g.*, the radial position of sectors), or on attributes of the data itself. In neither case is this decision made according to an indicator of the number of times a block has been erased. The Yada et al. reference also decides whether to decode data being read solely on the location of the data. Nowhere does this reference provide any suggestion that this decision is made based on an attribute of the block to which the data is to be written. As previously argued, optimization of memory usage in the memory of Yada et al. depends on the nature of the data itself. In contrast, the method of claim 16 attains optimal usage of the non-volatile memory capacity regardless of the type of data or application, with the optimization being adjusted over time with increasing numbers of erase cycles for the memory blocks.

For these reasons, Applicants submit that claim 16 and its dependent claims are patentably distinct over the references. Reconsideration of the rejection of these claims, and withdrawal of the final rejection after such reconsideration, is respectfully requested.

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[18] Bassett et al., *supra,* column 6, lines 39 through 47.
[19] Yada et al., *supra,* paragraph [0044].

Similarly as claim 1 discussed above, claim 21 is proposed to be amended to now include the limitation previously present in claim 24, which is now canceled accordingly. The memory system of claim 21 now requires that the indicator associated with the identified block has a value arranged to indicate whether the block is a reclaimed block. Because this limitation was previously present in claim 24, no new matter is presented by this amendment. Furthermore, this amendment to claim 21 results in a claim scope that was previously present in claim 24, and as such Applicants submit that the amendment to claim 21 does not require further consideration or search.

Applicants submit that the combined teachings of the references fall short of the requirements of proposed amended claim 21, specifically because none of the references teaches using an indicator of reclaimed blocks to select one of multiple error detection encoding algorithms.

As previously discussed relative to claim 1, the Bassett et al. reference is directed to the error correction coding of data in a disk drive, in which different error correction strategies are applied according to the radial position of the sector to which data is to be written,[20] or according to the type of data to be written to the disk.[21] But nowhere does the Bassett et al. reference anywhere disclose any structure for encoding data, even in its disk drive, according to a either a first error detection algorithm or a second error detection algorithm, based on whether a physical block has been reclaimed. The Yada et al. reference adds no teaching regarding the selection of an ECC codes responsive to whether a block is a reclaimed block. Indeed, the Yada et al. reference does not teach making this determination based on any attribute of the block to which the data is to be written. Rather, the Yada et al. reference performs ECC coding according to the type of data to be written; "frequently-written parameter data" are stored in a specified area and is ECC coded, and "program data or the like" are stored in other storage areas, without ECC coding.[22] The "predetermined number of rewrite assurances" of the memory cells asserted by

[20] Bassett et al., *supra,* column 5, lines 9 through 14.
[21] Bassett et al., *supra,* column 6, lines 39 through 47.
[22] Yada et al., *supra,* paragraph [0029].

the Examiner as meeting the claim[23] is not used, according to the reference, to determine whether to apply ECC to the data to be written to the memory. Instead, according to the Yada et al. reference, it is the type of data to be written that determines in which portion of memory the data will be written, and thus whether ECC is applied.[24] Applicants therefore submit that both the Bassett et al. reference and the Yada et al. reference fail to meet the elements of code devices for obtaining an indicator associated with a block that has a value arranged to indicate whether the block is a reclaimed block, or code devices for encoding the data, as required by proposed amended claim 21.

Accordingly, Applicants submit that the combined teachings of the Bassett et al. and Yada et al. references fall short of the requirements of claim 21 and its dependent claims. Applicants also submit that there is no suggestion from the prior art to modify these teachings in such a manner as to reach the claim, considering that there is no mention in any of these references of reclaiming previously failed blocks of a semiconductor flash memory, much less using an indication of whether such a block is reclaimed to determine which of multiple error detection algorithms is to be applied to data written to that block. Applicants also submit that the important advantages provided by the system of proposed amended claim 21, such advantages including the optimizing of data storage in a non-volatile memory using error correction coding, Applicants submit that claim 21 and its dependent claims are patentably distinct over the prior art of record.

Entry of the proposed amendment to claim 21, and reconsideration of the rejection of claim 21 and its dependent claims, are respectfully requested.

For similar reasons as discussed above relative to claim 6, Applicants also respectfully traverse the rejection of claim 26 and its dependent claims, on the grounds that the combined teachings of the applied references (Bassett et al. and Yada et al.) fall short of the requirements of the claim, and that there is no suggestion from the prior art to modify those teachings so as to reach claim 26.

[23] Office Action, *supra*, page 9.
[24] Yada et al., *supra*, paragraph [0029] (emphasis in original).

As discussed above, there is no mention whatsoever in the Bassett et al. reference of any circuit or function for encoding data according to one of a first or a second error detection algorithm responsive to the value of an indicator of the number of times a block has been erased. Rather, the Bassett et al. reference is directed to the operation of a disk drive, in which different error correction strategies are applied according to the radial position of the sector to which data is to be written,[25] or according to the type of data to be written to the disk.[26]

Also as discussed above relative to claim 6, the Yada et al. reference adds no teachings to those of the Bassett et al. reference in this regard. While the Examiner asserts that the Yada et al. reference teaches that "[f]requently-rewritten parameter data is stored in the specified partial storage area, and program data or the like low in rewriting frequency are stored in other storage areas",[27] these teachings do not correspond to the claim limitation of an indicator indicative of a number of times a block has been erased, as obtained by code devices in the system of claim 26. Rather, these cited teachings of the Yada et al. reference disclose a decision based on attributes of the data to be written, rather than of the block in memory to which that data will be written. Accordingly, Applicants submit that the Yada et al. reference fails to disclose the code devices for obtaining an indicator, and the code devices for encoding data, both required by claim 26.

Applicants therefore respectfully submit that the combined teachings of the references fall short of the requirements of claim 26, because both references lack any teaching regarding the error correction coding decision being based on the value of an indicator of a number of times a block has been erased. Applicants further submit that there is no suggestion to modify these teachings to provide such an element and to thus reach claim 6.

The teachings of the Bassett et al. reference in regard to error correction code decisions are made based either on factors related to disk drives and not applicable to semiconductor non-volatile memories (e.g., radial position of sectors), or on attributes of the data itself. The Yada et al. reference also makes its decision regarding whether to apply error correction coding based on

[25] Bassett et al., *supra*, column 5, lines 9 through 14.
[26] Bassett et al., *supra*, column 6, lines 39 through 47.
[27] Office Action, *supra*, page 9.

the nature of the data itself, and not on any attribute of the block to which the data is to be written. Therefore, neither these references, nor any of the other references of record, suggest modifying the Bassett et al. and Yada et al. teachings to examine the erase count to determine whether to encode according to one or another error detection algorithm. In contrast, the system of claim 26 can optimize the usage of the non-volatile memory regardless of the type of data or application, and indeed enables adjusting this optimization over time as the number of erase cycles increase for the blocks of the memory.

For these reasons, Applicants submit that claim 26 and its dependent claims are patentably distinct over the references. Reconsideration of the rejection of these claims, and withdrawal of the final rejection after such reconsideration, is respectfully requested.

Applicants also traverse the final rejection of claim 33 and its dependent claims.

Claim 33 is directed to a memory system for reading data stored in a non-volatile memory, including code devices for obtaining an indicator for an identified block, where the indicator is indicative of a number of times the identified block has been erased. The system also includes code devices for determining whether the indicator is less than a threshold value, and code devices for decoding data from a block using a first error detection algorithm responsive to the indicator being less than a threshold value, and code devices for decoding the data using a second error detection algorithm that has a higher error detection capability than the first, responsive to the indicator not being less than the threshold value.

As discussed above, the Bassett et al. reference is directed to the operation of a disk drive, in which different error correction strategies are applied according to the radial position of the sector to which data is to be written,[28] or according to the type of data to be written to the disk.[29] There is no disclosure, in the Bassett et al. reference, of the reading back of data from the disk sectors, involving decoding of the data according to a selected error correction code in response to the value of an indicator, much less such an indicator having a value indicative of a

[28] Bassett et al., *supra,* column 5, lines 9 through 14.
[29] Bassett et al., *supra,* column 6, lines 39 through 47.

number of times that a block has been erased. Indeed, there is no mention whatsoever in the Bassett et al. reference of encoding data in the first place, according to one of a first or a second error detection algorithm responsive to the value of an indicator of the number of times a block has been erased. The Yada et al. reference also lacks teachings in this regard., instead disclosing merely the reading back of data from the storage area storing ECC encoded data, by executing the error-correcting program.[30] The reference teaches neither the encoding of data nor the decoding of data responsive to the value of an indicator that is indicative of a number of times a block has been erased, as claimed. Rather, the reference teaches determining whether to decode using ECC based on the location of the memory from which the data is being read. This is consistent with its teachings that the encoding decision is based on attributes of the data to be written, rather than of the block in memory to which that data will be written.

Applicants therefore respectfully submit that the combined teachings of the references fall short of the requirements of claim 33. Applicants further submit that there is no suggestion to modify these teachings in such a manner as to reach claim 33 and its dependent claims. The combination of the Bassett et al. reference and the Yada et al. reference teaches only error correction code decisions that are made based either on factors that are not applicable to semiconductor non-volatile memories (*e.g.*, the radial position of sectors, as taught by Bassett et al.), or on attributes of the data itself (as taught by both references). Nowhere is it suggested that this decision is made based on an attribute of the block to which the data is to be written. In contrast, the system of claim 33 attains optimal usage of the non-volatile memory capacity regardless of the type of data or application, with the optimization being adjusted over time with increasing numbers of erase cycles for the memory blocks.

For these reasons, Applicants submit that claim 33 and its dependent claim are patentably distinct over the references. Reconsideration of the rejection of these claims, and withdrawal of the final rejection after such reconsideration, is respectfully requested.

[30] Yada et al., *supra,* paragraph [0044].

For the above reasons, Applicants respectfully submit that, upon entry of this amendment, all claims in this case will be in condition for allowance. Alternatively, Applicants submit that entry of this amendment will place this case in better condition for appeal. Entry of this amendment in this application, and favorable reconsideration of this application in light of that amendment and the accompanying remarks, are respectfully requested.

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